

REMARKS

Claims 1, 2, and 10 to 13, as amended, appear in this application for the Examiner's review and consideration. Claims 3 to 9 were canceled by previous Amendment. The amendments are fully supported by the specification and claims as originally filed. Therefore, there is no issue of new matter.

Applicants submit that the presently claimed invention is directed to a highly corrosion-resistant hot-dip galvanized steel product. The claims have been amended as follows:

Claim 1 has been amended to recite that the steel product has on its surface a 10 to 350 g/m² zinc alloy plating layer consisting of 4 to 10 percent by mass of Al, 1 to 5 percent by mass of Mg, up to 0.1 percent by mass of Ti and a balance of Zn and unavoidable impurities, and that the size of a dendrite in an [Al phase] in the plating layer is up to 500μm;

Claim 2 has been amended to recite that the steel product has on its surface a 10 to 350 g/m² zinc alloy plating layer consisting of 4 to 22 percent by mass of Al, 1 to 5 percent by mass of Mg, up to 0.1 percent by mass of Ti, up to 0.5 percent by mass of Si and a balance of Zn and unavoidable impurities, the plating layer contains a Ti-Al base intermetallic compound consisting of Ti (Al_{1-x} Si_x)₃ (wherein X = 0 to 0.5) in one or more of the [Al phase], [Zn₂Mg phase] and [Zn phase], and that the size of a dendrite in an [Al phase] in the plating layer is up to 500μm;

Claim 10 has been amended to recite that the steel product has on its surface a zinc alloy plating layer consisting of 4 to 22 percent by mass of Al, 1 to 5 percent by mass of Mg, up to 0.1 percent by mass of Ti, up to 0.5 percent by mass of Si and a balance of Zn and unavoidable impurities, and the plating layer containing a Ti-Al base intermetallic compound consisting of Ti (Al_{1-x} Si_x)₃ (wherein X = 0 to 0.5) in one or more of the [Al phase] and [Zn phase];

Claim 11 has been amended to recite that the steel product has on its surface a zinc alloy plating layer consisting of 4 to 10 percent by mass of Al, 1 to 5 percent by mass of Mg, up to 0.1 percent by mass of Ti and a balance of Zn and unavoidable impurities, and the plating layer contains a Ti-Al base intermetallic compound consisting of TiAl₃ in one or more of the [Al phase], [Zn₂Mg phase] and [Zn phase];

Claim 12 has been amended to recite that the steel product has on its surface a zinc alloy plating layer consisting of 4 to 22 percent by mass of Al, 1 to 5 percent by mass of Mg, up to 0.1 percent by mass of Ti, up to 0.5 percent by mass of Si and a balance of Zn and

unavoidable impurities, and the plating layer contains a Ti-Al base intermetallic compound consisting of Ti ($Al_{1-x}Si_x$)₃ (wherein $X = 0$ to 0.5) in one or more of the [Al phase], [Zn₂Mg phase] and [Zn phase], and

Claim 13 has been amended to recite that the steel product has on its surface a zinc alloy plating layer consisting of 4 to 22 percent by mass of Al, 1 to 5 percent by mass of Mg, up to 0.1 percent by mass of Ti, up to 0.5 percent by mass of Si and a balance of Zn and unavoidable impurities, and the plating layer containing a Ti-Al base intermetallic compound consisting of Ti ($Al_{1-x}Si_x$)₃ (wherein $X = 0$ to 0.5) in one or more of the [Al phase] and [Zn phase].

As stated above, the present claims were amended to change the recitation of the transitional phrase “composed of” to “consisting of.” As stated in M.P.E.P. § 2111.03 the transitional phrase “consisting of” excludes any element, step, or ingredient that is not specified in the claim. As also stated in that section of the M.P.E.P., the transitional phrase “composed of” has been interpreted as either “consisting of” or “consisting essentially of,” depending on the facts of the particular case, and the transitional phrase “composed of” must be interpreted in light of the specification to determine whether open or closed claim language is intended.

In the present case, in light of the present specification, one of ordinary skill in the art would understand that original recitation of the phrase “composed of” in the claims was intended to provide closed claim language. The amendments of the claims to change “composed of” to “consisting of,” are intended to further clarify the claims.

Claims 1, 2, and 10 to 13 stand rejected under 35 U.S.C. § 102(b), as allegedly being anticipated by or, in the alternative, under 35 U.S.C. § 103(a), as allegedly being obvious over the English machine translation of Japanese Application Publication No. 2002-187234 to Fumishiro et al. (Fumishiro), for the reasons set forth on pages 2 to 4 of the Office Action.

In response, Applicants submit that, as discussed above, the presently claimed invention is directed to a highly corrosion-resistant hot-dip galvanized steel product. The claimed steel product has on its surface a zinc alloy plating layer consisting of the elements recited in the claims in the claimed concentration range. Any prior art reference that discloses additional elements in a zinc alloy plating layer is outside the scope of the present claims.

Fumishiro is cited in the Office Action for the disclosure of a corrosion resistant hot-dip galvanized steel having a zinc alloy surface coating comprising 4 to 22 percent Al, aluminum, 1 to 4 percent Mg, magnesium, up to 0.1 percent Ti, titanium, and up to 0.5

percent Si, silicon, and that phases of Al/Zn/Zn₂Mg are formed. Applicants submit that Fumishiro also discloses that the zinc alloy surface coating may also contain up to 0.045 percent B, boron. *See, e.g.*, the Abstract.

In addition, in paragraph [0009], Fumishiro discloses that the inclusion of Ti and B can be included in a Zn-Al-Mg system hot-dipping layer to control the generation and growth of a Zn₁₁Mg₂ interlayer. In paragraphs [0016], [0017], and [0018], Fumishiro again discloses that the presence of a Ti-B system in the hot-dipping layer.

As will be understood by those skilled in the art, the presence of the Ti-Al intermetallic compound, recited in the present claims, requires the presence of Ti in the hot-dipping layer disclosed by Fumishiro. However, Fumishiro clearly discloses that when Ti is present in the hot-dipping layer, B must also be present. *See* Fumishiro, paragraphs [0009] and [0016] to [0018]. Therefore, to obtain a hot-dipping layer containing the Ti-Al intermetallic compound recited in the present claims in the hot-dipping layer disclosed by Fumishiro, Fumishiro requires that the hot-dipping layer must also contain B. That places the disclosure of Fumishiro outside the scope of the present claims. That is, Fumishiro discloses two types of hot-dipping layers:

Hot-dipping layers that lack Ti, and, thus, lack the Ti-Al intermetallic compound recited in the present claims; and

Hot-dipping layers containing Ti and B.

Therefore, Fumishiro does not disclose a hot-dipping layer that contains a Ti-Al intermetallic compound that is also free of B. The hot-dipping layers disclosed by Fumishiro are outside the scope of the present claims, and provide no reason for one of ordinary skill in the art to make or use the presently claimed steel product.

Therefore, as Fumishiro does not disclose the presently claimed steel product, and provides no reason for one of ordinary skill in the art to make or use the presently claimed steel product, the present claims are not obvious over Fumishiro. Accordingly, it is respectfully requested that the Examiner withdraw the rejections of claims 1, 2, and 10 to 13 under 35 U.S.C. §§ 102(b) and 103(a) over Fumishiro.

Claims 1 and 11 stand rejected under 35 U.S.C. § 102(b), as allegedly being anticipated by or, in the alternative, as allegedly being unpatentable over International Publication No. WO 98/26103 to Komatsu et al. (Komatsu), for the reasons set forth on pages 4 and 5 of the Office Action. Corresponding patents issued in the United States as U.S. Patents Nos. 6,235,410 and 6,379,820.

As discussed above, claims 1 and 11 recite a zinc alloy plating layer consisting of 4 to 10 percent by mass of Al, 1 to 5 percent by mass of Mg, up to 0.1 percent by mass of Ti, and a balance of Zn and unavoidable impurities. In addition, the present claims recite the presence of a Ti-Al base intermetallic compound in the zinc alloy plating layer. Therefore, one of ordinary skill in the art will understand that Ti must be present in the zinc alloy plating layer of the presently claimed corrosion-resistant hot-dip galvanized steel product.

As cited in the Office Action, Komatsu discloses hot-dip Zn-Al-Mg plated steel sheet good in corrosion resistance and surface appearance that is a hot-dip Zn-base plated steel sheet obtained by forming on a surface of a steel sheet a hot-dip Zn-Al-Mg plating layer composed of 4.0 to 10 weight percent Al, 1.0 to 4.0 weight percent Mg, and a balance of Zn and unavoidable impurities. Komatsu also discloses that to obtain a plating layer possessing the desired metallic structure, the cooling rate of the plating layer adhering to a steel strip extracted from a plating bath and the plating bath temperature must be appropriately controlled in a continuous hot-dip plating machine and/or appropriate amounts of Ti and B must be added to the bath. *See* Komatsu '820, Abstract and column 11, lines 10 to 14 and 33 to 42.

Although Komatsu does not require the presence of Ti or B in the disclosed plating layer, those skilled in the art will understand that Ti must be present in a plating layer to obtain a plating layer containing the Ti-Al intermetallic compound recited in the present claims. In addition, the clear teaching of Komatsu is that B must be present in the disclosed plating layer when Ti is present. *See id.* Therefore, Komatsu discloses two types of plating layers:

Plating layer that lack Ti, and, thus, lack the Ti-Al intermetallic compound recited in the present claims; and

Plating layers containing Ti and B.

Therefore, Komatsu does not disclose a plating layer that contains a Ti-Al intermetallic compound that is also free of B. The plating layers disclosed by Komatsu are outside the scope of the present claims, and provide no reason for one of ordinary skill in the art to make or use the presently claimed steel product.

Therefore, as Komatsu does not disclose the presently claimed steel product, and fails to provide any reason for one of ordinary skill in the art to make or use the presently claimed steel product, the present claims are not anticipated by or obvious over that reference. Accordingly, it is respectfully requested that the Examiner withdraw the rejections of claims 1 and 11 under 35 U.S.C. § 102(b) and 35 U.S.C. § 103(a) over Komatsu.

Applicants thus submit that the entire application is now in condition for allowance, an early notice of which would be appreciated. Should the Examiner not agree with Applicants' position, a personal or telephonic interview is respectfully requested to discuss any remaining issues prior to the issuance of a further Office Action, and to expedite the allowance of the application.

A separate Petition for Extension of Time is submitted herewith. Should any other fees be due, however, please charge such fees to Deposit Account No. 11-0600.

Respectfully submitted,

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